

**Secondhand Smoke Exposure in Restaurant and Bar Workers
Before and After Lexington's Smoke-free Ordinance**
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Purpose of the research study: To evaluate the effect of Lexington's smoke-free law on:
(a) the exposure of restaurant and bar workers to secondhand smoke (SHS), as measured by hair nicotine levels; (b) self-reported respiratory symptoms and smoking behavior; and (c) attitudes toward the smoke-free law.

Background: Food service workers are disproportionately affected by secondhand smoke exposure.¹ Only 43% of the 6.6 million food service preparation and service occupations workers are protected by smoke-free policies, compared to 75% of white collar workers. Bar and restaurant workers who are not protected are exposed to SHS levels 2 to 6 times higher than that of other workers.^{2,3} In cities without smoke-free laws, full-time bar and restaurant workers are exposed at work more than four times the average annual *outdoor* limits of fine particle air pollution.⁴ Bartenders who work in establishments that allow smoking are at higher risk than people who work alongside freeways and at toll collection booths.⁵ Exposure to SHS in the workplace presents substantial acute health hazards to employees including increased respiratory problems and decreased lung function.^{1, 6-8} There is much to be gained by eliminating smoking in public places. For example, after passage of Ireland's smoke-free law, levels of carbon monoxide in nonsmoking bar workers decreased by 45%.⁹

In 1993, Environmental Protection Agency (EPA) classified tobacco smoke as a Group A carcinogen, and determined that SHS increases the risk of lung cancer in healthy nonsmokers.¹⁰ SHS not only increases the risk of lung cancer but also is a major cause of acute heart disease, respiratory infections, asthma attacks, and decreased lung function in adults.¹¹⁻¹⁷ Secondhand smoke exposure increases the risk of heart disease by 50-60%, twice the previous estimated risk.^{13, 16, 18} As little as 30 minutes of SHS exposure places individuals at an increased risk for acute heart attack.¹⁹ Secondhand smoke exposure increases the risk of developing breast cancer in pre-menopausal women,²⁰ many of whom work in restaurants and bars.

On April 27, 2004, Lexington-Fayette County implemented a smoke-free ordinance prohibiting smoking in all public buildings including restaurants, bars, bingo parlors, pool halls, public areas of hotels/motels, and all other buildings open to the public. Lexington-Fayette County and Georgetown are the only two communities in Kentucky with a smoke-free law.

Study Methods: A sample of 106 adult restaurant and bar workers were recruited from 37 restaurants and five bars that were randomly selected from a total of 486 restaurants and bars in Lexington-Fayette County. A complete list of establishments was obtained from the Lexington-Fayette County Health Department. The following types of establishments were eliminated from the complete list before selecting the random sample: institutional cafeterias, convenience stores, donut shops, catering businesses, ice cream stores, drive-in restaurants, snack bars and carry-out establishments, private clubs, banquet halls, racetracks. Nearly three-fourths of the sample worked in restaurants serving alcohol (73.3%); 14.3% worked in restaurants not serving alcohol; and 12.4% worked in stand alone bars. Participants were 18 years of age or older, worked a minimum of 10 hours per week and had worked at least 30 days in their respective work establishments. Workers were asked to participate in three phone or face to face interviews (before the smoke-free law, 3 months post-law, and 6 months post-law), and provide two hair samples, one before the law went into effect and one after the 3-month interview to evaluate secondhand smoke exposure.

Interviews assessed all sources of SHS exposure (work, home, vehicles, other), participants' smoking status, respiratory symptoms, smoking policies at their work establishments, attitudes toward the smoke-free law, and demographic characteristics. Hair nicotine samples were obtained from research subjects as an objective way to measure how much a person is exposed to SHS. Approximately 0 - 50 mg (about 10-15 strands) of hair was cut from the back of the scalp. These nicotine levels are measured by dissolving the hair and then analyzing its contents with special laboratory equipment (HPLC) using well-established methods. Each hair sample is cleaned thoroughly to remove any nicotine on the outside of the hair before conducting the laboratory analysis. Thus, the nicotine levels represent either actively smoking or breathing the smoke of cigarettes from others who smoke. Hair samples have been shown to be a reliable and valid measure of up to one month of cumulative tobacco smoke exposure.²¹

Characteristics of the Sample: The majority of workers were female (63%) and Caucasian (87%), with an average age of 26 years (see Table 1). Most had at least some college education (85%) and were not married (80%). Two-thirds reported working 21-40 hours per week. Thirty-eight percent were current smokers.

At 3 months post-law, 71 workers remained in the study (33% attrition rate). At 6 months post-law, 60 workers remained in the study (43% attrition from the pre-law assessment). We were unable to reach those who dropped out either due to moving or not employed in the restaurant or bar industry. Drop outs and those remaining in the study were not different on gender, ethnicity, education, marital status, hours worked, smoking status, or cigarettes smoked per day.

Findings:

Changes in Hair Nicotine Levels

- The median nicotine level prior to the smoke-free law was 1.71 ng nicotine/mg (see Figure 1). The same workers again provided hair samples 3 months after the law went into effect, and the level of nicotine in their hair decreased by more than half to 0.75 ng/mg; that is, there was a decrease of 56% in the level of exposure to tobacco after the law went into effect. The decrease was significant, and the 95%

confidence intervals for the two medians were from 0.99 to 2.78 for the pre-law hair nicotine level and from 0.65 to 0.95 for the post-law level. Given that the number of cigarettes smoked on a typical day did not change during this time period, this decline in hair nicotine can be attributed to a decrease in exposure to secondhand smoke. Although number of cigarettes smoked per day did not change for the group as a whole, an additional analysis was conducted that took into consideration the possible influence of personal smoking patterns (i.e., cigarettes smoked per day), and there was still a statistically significant decline from pre- to post-law. A further comparison between pre- and post-law was conducted, also taking into account cigarettes per day; this analysis used a respondent's pre-law hair nicotine level as the post-law level, if that respondent had dropped out. As a result, there was still a significant decline in hair nicotine for the group as a whole when using this conservative analysis.

Changes in Self-reported Exposure to Secondhand Smoke

- There was a significant drop in average number of hours exposed to secondhand smoke at work in the past 7 days (32 hours per week, pre-law, to 1-2 hours per week, post-law; see Figure 2). Exposure to SHS in homes and vehicles remained unchanged during this time period. Exposure to secondhand smoke in places other than primary workplace, home, or vehicle decreased significantly between the 3 month post-law interview and the one conducted at 6 months after the law (19 hours per week, pre-law; 15 hours at 3 months post-law; and 7 hours per week at 6 months post-law; see Figure 2).
- Total hours of exposure to SHS from all sources dropped significantly from the pre- to post-law period (69 hours per week pre-law, followed by 35 and 31 hours weekly during the 3 month and 6 month post-law interviews, respectively).

Changes in Respiratory Symptoms and Smoking Behaviors

- Workers were less likely to report colds and sinus infections after the law went into effect (84%, pre-law; 49% at 3-months and 50% at 6 months; see Figure 3).
- Most smokers reported smoking $\frac{1}{2}$ pack of cigarettes per day or less pre-law (see Figure 4). There was no significant change in smoking behaviors among restaurant and bar workers after the smoke-free law went into effect.
- Smokers reported fewer cravings to smoke over time: 83%, pre-law; 33% at 3-months, and 20% at 6-months post-law.

Changes in Attitudes toward the Smoke-free Law

- Among these restaurant and bar workers, there was no difference over time in support for the smoke-free law (66%, pre-law; 65% at 3 months; and 68% at 6 months). About two-thirds expressed support for the smoke-free law.
- Non-smokers were more likely than smokers to indicate support for the law during both the pre- and post-law periods (see Figure 5).

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Table 1. Characteristics of the Sample, Pre-Law and 3- and 6-months Post-Law

Personal Characteristic	Pre-law	3 months	6 months
	N = 106	Post-law n = 71	Post-law n = 60
	<u>n</u> (%)	<u>n</u> (%)	<u>n</u> (%)
<u>Sex</u>			
Female	66 (63)	42 (61)	35 (60)
Male	38 (37)	27 (39)	23 (40)
<u>Ethnicity</u>			
White	90 (87)	60 (88)	52 (91)
African American	4 (4)	2 (3)	0 (0)
Other ethnicity	9 (9)	6 (9)	5 (9)
<u>Education</u>			
Less than High School	6 (6)	4 (6)	2 (3)
High School or GED	10 (9)	4 (6)	4 (7)
Some college or voc ed	68 (65)	47 (66)	39 (65)
College grad or more	21 (20)	16 (22)	15 (25)
<u>Marital Status</u>			
Married	21 (20)	15 (21)	14 (23)
Not Married	82 (80)	56 (79)	46 (77)
<u>Hours worked per week</u>			
10-20	13 (13)	11 (15)	9 (15)
21-30	35 (34)	21 (30)	23 (38)
31-40	32 (32)	25 (35)	12 (20)
More than 40	21 (21)	14 (20)	16 (27)
<u>Currently smoke</u>			
No	64 (62)	42 (60)	38 (63)
Yes	40 (38)	28 (40)	22 (37)
<u>Cigarettes per day</u>			
None	64 (62)	42 (60)	38 (64)
10 or less	21 (20)	19 (27)	13 (22)
11-20	14 (14)	7 (10)	7 (12)
21 or more	4 (4)	2 (3)	1 (2)

Note: The average age at baseline for the 106 participants was 26.1 with a *SD* of 8.0; participants ranged in age from 18 to 57 years.

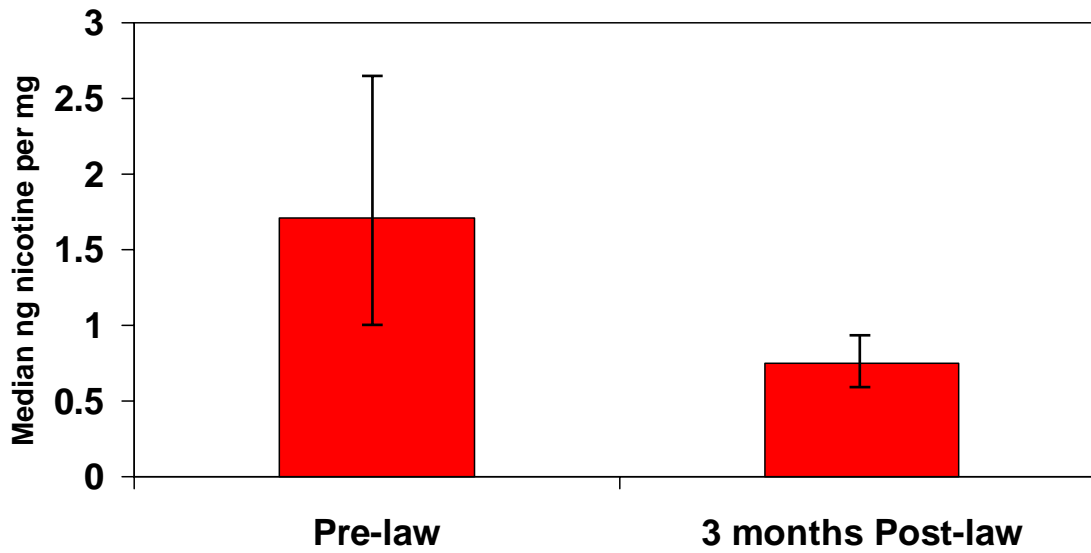


Figure 1. Median Hair Nicotine Levels Pre- and Post-law, with 95% confidence intervals

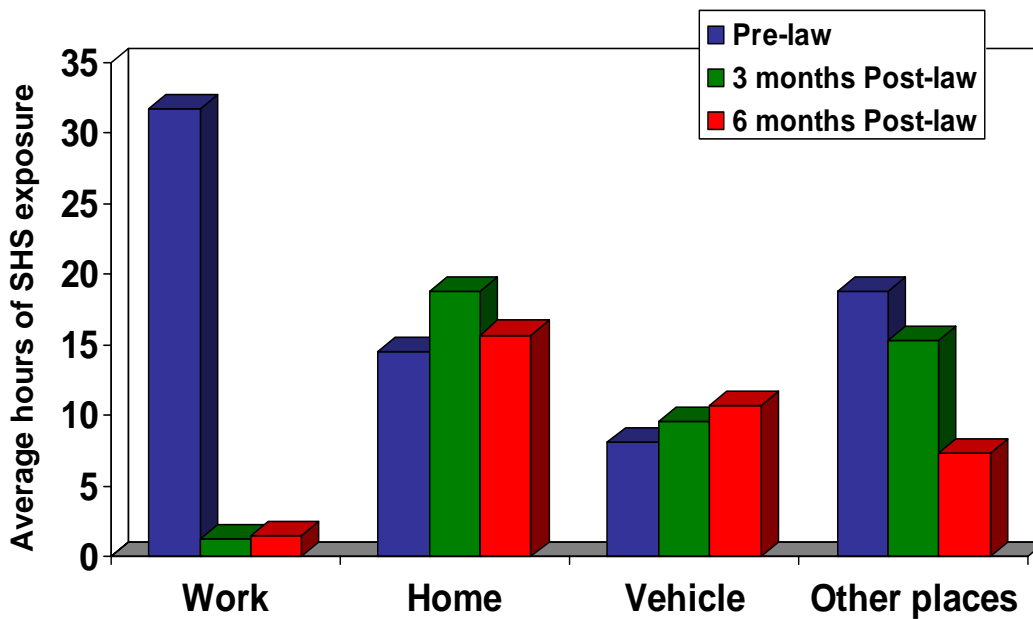


Figure 2. Average Hours of Self-reported SHS Exposure in the Last 7 Days: Work, Home, Vehicle, and Other

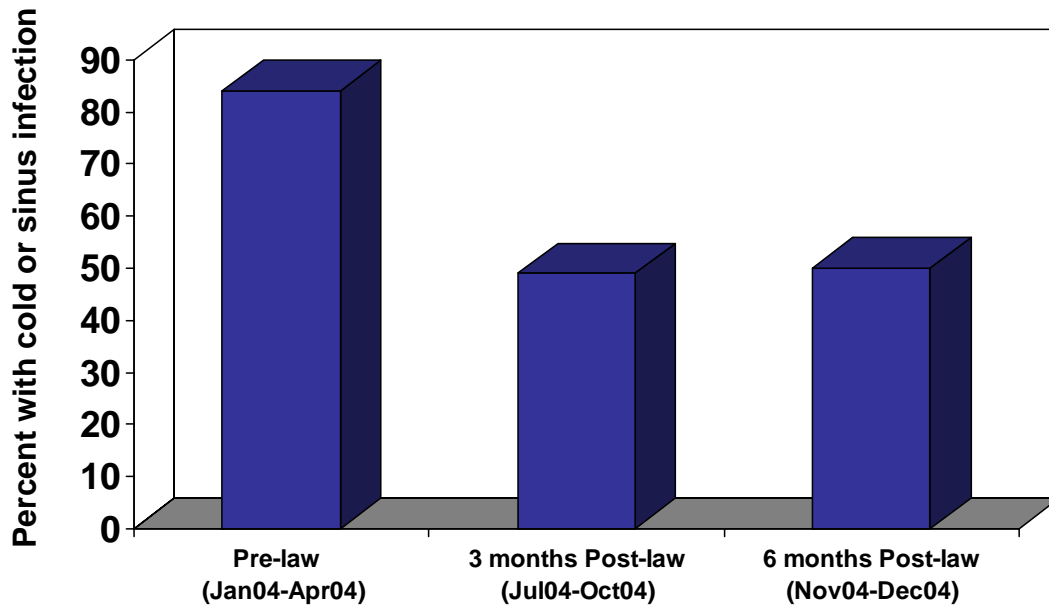


Figure 3. Percent of Workers Who Reported Colds/Sinus Infections, Pre-Law and 3- and 6-Months Post-Law

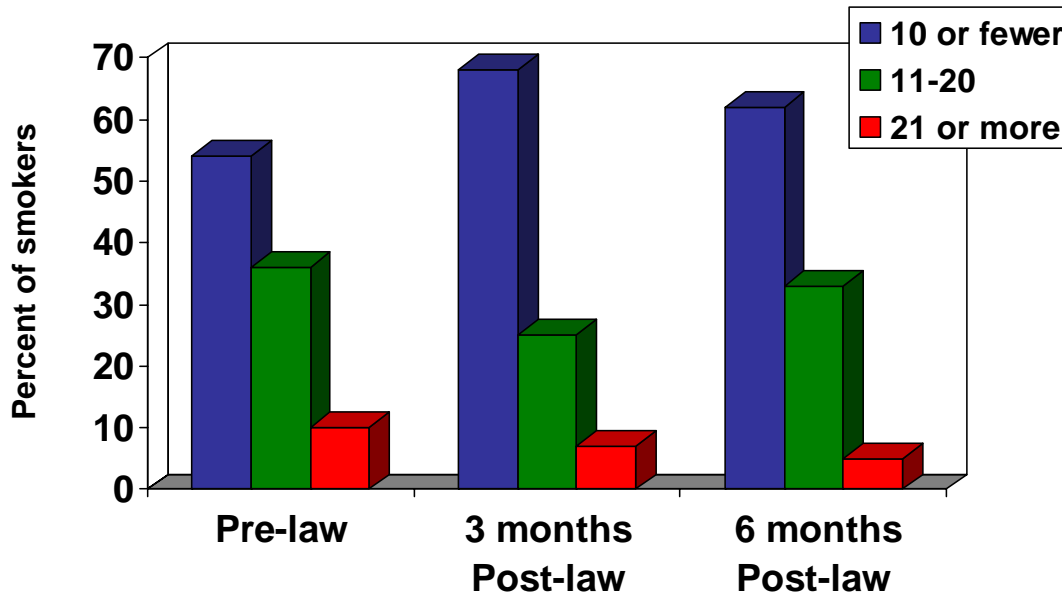


Figure 4. Cigarettes Smoked Per Day on a Typical Day

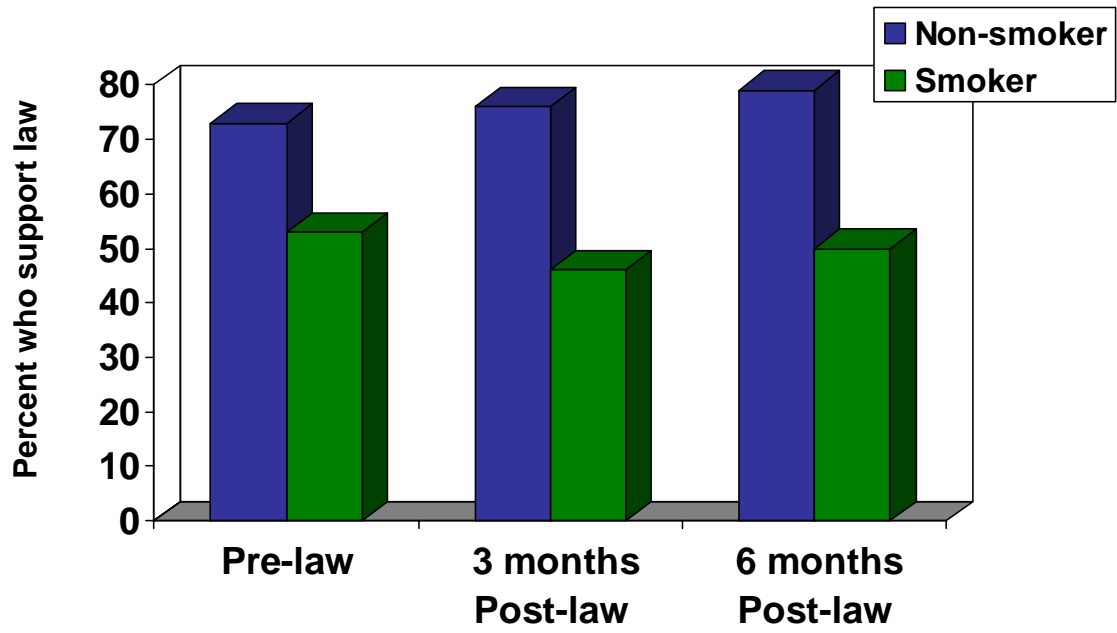


Figure 5. Percent of Smoking and Nonsmoking Workers who Support the Smoke-free Law